of *Lampides boeticus* (Linnaeus) and *Theclinesthes onycha onycha* (Hewitson) from Erskine Island, Capricorn Group, Queensland, and states that suitable food plants for these species are absent on the island suggesting immigration from elsewhere. Fletcher (1973) discusses an apparent influx of *Zizina otis labradus* on Heron Island (also of the Capricorn Group) following a north-west wind. He also mentions the sighting of "a few small Lycaenids (probably *Z. otis labradus* and/or *N. biocellata biocellata*)" over the sea during his trip back to the mainland. Sankowsky (in litt.) writes concerning a migration of *Lampides boeticus* in 1974 on Mount Tamborine, south-east Queensland, as follows: "During August and September we had a massive migration of *Lampides boeticus*. These were heading south in a continuous flow for two weeks after which numbers gradually declined. On Tamborine they laid thousands of eggs on every type of legume flower available. Towards the end they were heading more west than south." There appear to be no further records of Australian lycaenid migration.

Acknowledgements

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OBSERVATIONS ON OVIPOSITION IN AN AUSTRALIAN CRANE-FLY (DIPTERA: TIPULIDAE)

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Abstract

The first observations on oviposition dancing in an Australian tipulid fly of the genus *Leptotarsus* are described. Dancing was observed in shaded areas under the canopy of vine scrub in winter. Recovery of eggs from soil danced upon by two tipulids confirms the association of dancing with oviposition.

Introduction

Oviposition "dancing" is known to occur in several European genera of the subfamily Tipulinae (Pierre, 1924; Seguy, 1951) but such behaviour has not before been recorded for any Australian species. It is interesting therefore to record these behavioural observations in an undescribed species of *Leptotarsus*, subgenus *Habromastix* discovered near Biggenden, Queensland in 1973. The family is of very ancient origin and *Habromastix* may well be an ancient relict dating from Pangaen days (c. 100 million years ago) as its recorded distribution outside Australia is in Africa and South America (D. H. Colless, pers. comm.). This would suggest that "dancing", used in a purely descriptive sense, is an ancient feature of this subfamily.

Methods and observational area

Oviposition dancing was observed in two days in May (total observation time about 5 hours) and on 23rd June 1973 (total observation time about 4 hours) and involved many flies, probably all females, of which at least 30 were counted in May and 50 on 23rd June.

The observations were carried out in a gully covered with dense vine scrub on the property of Mr. B. D. Geissler about 7 km from Biggenden, Queensland (Fig. 1). The scrub-covered portion of the gully is about 1½ km long and about ½ km wide at its widest. The canopy is almost continuous throughout and rises to a maximum height of about 10 m. There is no undergrowth other than a few scattered thickets of *Lantana camera*. The deepest part of the gully fills with water during or towards the end of summer rains, usually from December to February, and is dry for the rest of the year. Outside the water run-off, the ground is covered with sand, rocks, a few rotten logs, fallen leaves and other canopy debris. Seldom is the forested part of the gully flooded.

The tipulids observed therefore live in a fairly restricted habitat and have been seen there only in winter (May to June). Temperatures during daylight hours are fairly high throughout the winter (e.g. 26°C on 23rd June) and conditions at this time are usually dry. In some years, during summer rains, the scrub area has been completely flooded with water levels of about 1 m maintained for several days.

Dancing and oviposition

During normal flight, the flies travel relatively slowly and usually less than 2 m above the ground. It would appear that all the flies observed were females. They fly with their long legs partly extended and the wings beating rapidly, the black legs, dark head, thorax and yellow abdomen

FIG. 1. Interior of a vine scrub where many tipulid flies were observed during oviposition dancing.

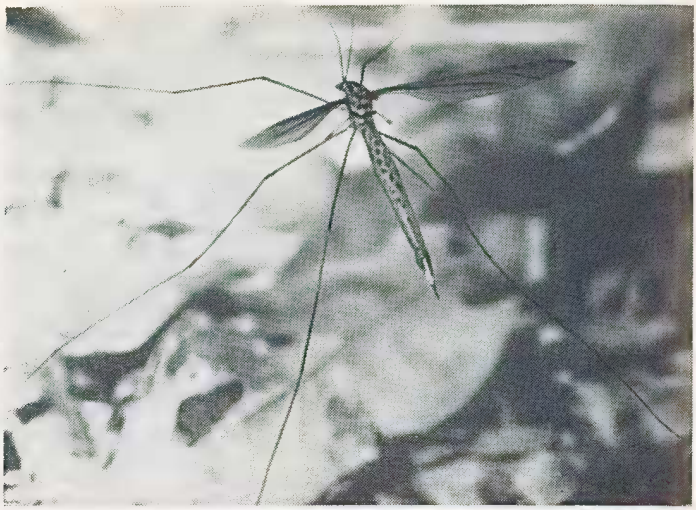

FIG. 2. Female tipulid fly as it lands on the forest floor during oviposition dancing.

forming a pattern that is very conspicuous to the human eye and possibly aposematic. Most flies were noticed flying in shady areas and very few in areas fully exposed to the sun.

During the May observations, more flies were seen dancing in the part of the gully that fills with water during summer rains than on the forest floor. However, on 23rd June only two flies (both females) were seen in the deeper part of the gully while all the others were observed in the forest area. In neither case were flies seen either landing or ovipositing on sites exposed to the sunlight.

Dancing begins when a female suddenly checks its flight and lands making full tarsal contact with the ground (Fig. 2). Almost immediately it bounces upwards and down again each bound or hop involving a vertical distance of about 20 cm. When doing so the abdomen is kept at about right angles to the ground and the ovipositor touches the ground at each landing. This behaviour is comparable to that of *Tipula vittata* of Europe which Pierre (1924) observed in April 1918 in France, and during which he appears to have seen flies passing one or two eggs each time. Although I did not actually see a fly passing eggs, the recovery of many in soil danced upon by two captive flies indicates that oviposition does occur during dancing. The ovipositor makes audible clicks when it contacts hard objects such as pebbles, dry leaves and bits of bark. There is an almost continuous series of clicks when several tipulids are dancing in the same area.

Dancing follows a zigzag pattern so that the ovipositor seldom strikes the same place twice and it may make 20 strikes in as many different points within an area of 10 cm^2 in less than a minute. Only a few strikes apparently lead to oviposition which appears to follow if the ovipositor contacts soft ground. When this occurs the fly stands on all

legs, the abdomen is held at right angles to the ground, the ovipositor is inserted into the ground and abdominal contractions can be observed. After insertion, a short period of time passes before the fly flies up and settles elsewhere. In soft ground the ovipositor leaves a distinctive hole in which it is assumed that the egg is laid, but it is not known whether oviposition accompanies every insertion.

Comparable behaviour has been observed and described by Séguy (1951) in females of the genus *Oreomyza*. He also sketched a female of *Tipula selen* Meigen, during "dance de ponte" and the female's posture is almost identical to that assumed by the females observed at Geissler's Scrub.

The intensity of dancing was seen to vary between individuals, but the zigzag pattern and the approach to shady spots were constant for all flies observed, as was the height reached during each hop. After dancing for a minute or more within an area, a fly might move away, flying close to the ground, and land a few metres away where the behaviour was repeated. Spacing out of dancing sites suggests that each fly lays eggs over a wide area wherever shade occurs. This spacing out of dancing sites and eggs was also observed by Séguy (1951) and Pierre (1924).

While ovipositing the flies showed no response to a static or moving object such as the observer, nor did they visibly react to the sudden flash of an electronic photographic flashgun. In fact they could be caught by hand or driven into a jar or killing bottle. The only reaction to a nearby stimulus was observed when on two occasions two dancing flies were seen to approach within less than 10 cm from each other whereupon each withdrew immediately, adopting the relatively wide spacing out seen on all occasions. Thus there seems to be a critical distance between females during oviposition, which could serve to space out the eggs and thus indirectly benefit the future larvae by reducing overcrowding on food resources in the soil. The importance of the ground litter to the larval life has already been mentioned by Pierre (1924).

Two specimens were caught in glass jars and provided with soil. They continued to dance on the soil for about 15 minutes but stopped dancing as soon as they were exposed to the full sunlight. That they were ovipositing during this behaviour is confirmed by the subsequent recovery of 79 eggs from the soil. The identity of the eggs is confirmed by Dr. D. H. Colless. A batch kept moist for four weeks contained typical tipulid larvae but for unknown reasons failed to develop.

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